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Conference Abstract

It Takes a Network: Building Biodiversity Knowledge Through Collaboration

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Abstract

Understanding biodiversity trends through time is complex (Johnson et al. 2024), and there is an urgent need to synthesize data across time and space to understand changes. Technological advances have expanded our ability to collect contemporary environmental data, yet understanding biodiversity trends also requires looking to the past. Previously collected data are often not only scattered across formats, especially analog, but also disciplines and institutions. Thus, valuable biodiversity records are difficult to access and underused in research and decision-making (Moritz et al. 2011). The Living Data Project (www.ciee-icee.ca/ldp.html), an initiative of the Canadian Society of Ecology and Evolution, brings together historical and contemporary sources to create curated datasets that inform regional and national biodiversity assessments.

Central to data rescue and synthesis is collaboration: datasets are often historical, as are the expertise and networks of the data holders. Building biodiversity knowledge systems,

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therefore, depends on partnerships spanning institutions, disciplines, and skill sets. Our collaborative workflow moves through four key stages:

1. **identifying and collecting legacy datasets,** often in partnership with archivists, librarians, and data stewards;
2. **digitizing and standardizing data** into interoperable formats with the help of graduate students, postdoctoral researchers, and faculty;
3. **analyzing biodiversity trends** through interdisciplinary collaboration among ecologists, statisticians, and spatial analysts;
4. **delivering outputs** that reach both science and society, from peer-reviewed publications to policy tools. We illustrate this process through two case studies.

A: Historical pesticide spraying in New Brunswick, Canada

Step 1: Forestry pesticide application records were historically managed at the provincial level, with files scattered across four provinces. Some records were digitized, but many remained only in hard copy. Government researchers recognized the value of these datasets for calculating cumulative pesticide loads but lacked the capacity to rescue them.

Step 2: A team of graduate students, mentored by a postdoctoral researcher and faculty, compiled, digitized, and standardized pesticide application records. The digitized dataset is archived on the Government of Canada's open data portal and published as a data paper in *Ecology* (Heartz et al. 2023).

Step 3: A working group (WG) convened ecologists, toxicologists, statisticians, and GIS specialists to integrate the pesticide dataset with aquatic community data from the Canadian Aquatic Biomonitoring Network. This WG collaboratively defined criteria for recovery, evaluated legacy effects of multiple pesticides, and assessed drivers of aquatic community resilience.

Step 4: This project produced new insights into ecosystem recovery from pesticide disturbances, culminating in an article in *Environmental Pollution* (Sugden et al. 2025), presentations at national conferences, and StoryMaps to engage the public.

B: The Living Planet Index as a biodiversity indicator.

Step 1: The Living Planet Index (LPI) database, managed by the Zoological Society of London (ZSL) and World Wildlife Fund (WWF), aggregates more than 38,000 vertebrate time series worldwide, including over 8,000 from Canada (928 species from 1950–2018). Source data include peer-reviewed literature, government reports, and citizen science. Many Canadian records lacked georeferencing, however, and concerns remained about potential biases due to these gaps.

Step 2: Graduate students, postdocs, and faculty mentors worked with WWF and ZSL staff to georeference Canadian LPI time-series data, harmonizing variables such as location, taxonomic resolution, and monitoring methods. The resulting database provided the

foundation for two subsequent international WGs on LPI data sensitivity and representativeness.

Step 3: Subgroups of these WGs asked: How sensitive is the LPI to different treatments of zeros, short or sparse time series, or outliers?; What is the minimum sample size needed to reproduce the overall trend?; Can indicator species be identified for poorly monitored areas?

Step 4: These collaborations generated multiple outputs. A *FACETS* article (Currie et al. 2022) explores the identification of indicator species; a manuscript currently in review tests the sensitivity and robustness of the LPI (Currie et al. 2025). A toolkit for applying sensitivity analyses to national indices is also in development for conservation practitioners. These outputs ensure that biodiversity indicators remain both scientifically rigorous and policy-relevant, supporting Canada's international reporting obligations.

Conclusion

By combining legacy datasets and interdisciplinary expertise, we can unlock biodiversity data that would otherwise remain inaccessible. A collaborative workflow—identifying, digitizing, analyzing, and delivering—can transform disparate datasets into knowledge that informs both science and policy in an era of rapid ecological change.

Keywords

collaboration, data rescue, working groups

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Conflicts of interest

The authors have declared that no competing interests exist.

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